

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :  
B29C 65/06, F16L 47/02 // B29L 23:00

A1

(11) International Publication Number: WO 97/17188

(43) International Publication Date: 15 May 1997 (15.05.97)

(21) International Application Number: PCT/GB96/02711

(22) International Filing Date: 6 November 1996 (06.11.96)

(30) Priority Data:  
9522776.5 7 November 1995 (07.11.95) GB

(71) Applicant (for all designated States except US): FUSION GROUP PLC (GB/GB); Chesterfield Trading Estate, Sheep-bridge, Chesterfield S41 9PZ (GB).

(72) Inventor; and

(75) Inventor/Applicant (for US only): JENNINGS, Peter, Michael (GB/GB); 59 Shakespeare Crescent, Dronfield, Sheffield S18 6NB (GB).

(74) Agents: HOUGHTON, David et al; Hulse & Co., Eagle Star House, Carver Street, Sheffield S1 4FP (GB).

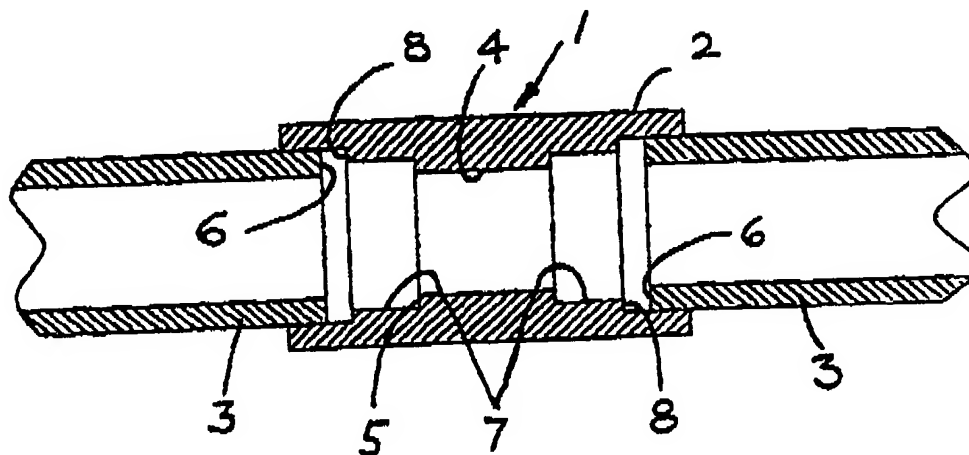
(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: WELDED CONNECTIONS



(57) Abstract

The invention relates to welded connections and in particular to so-called spin welding of pipes and/or pipe fittings to an interposer coupling member, and where the coupling member is spun at a high rate after the insertion of the ends of the pipes and/or pipe fittings to melt the plastics material at the interface and create a welded connection. Such techniques are adequate for relatively small diameters for pipes/fittings but not for larger diameters which can exhibit a greater degree of lack of circularity or a lack of homogeneity of molten material at the interface. The object of the present invention is to overcome this difficulty which objective is met by a construction of coupling sleeve-like member (1) of plastics material comprising at least one inwardly projecting circumferential rib (4) within its bore, and there being an abutment means (7) associated with the radial surfaces of the rib or ribs facing a respective end of the coupling sleeve-like member, to engage the end of a respective pipe or pipe fitting during the spinning of the coupling sleeve-like member.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

## WELDED CONNECTIONS

This invention relates to welded connections and is particularly concerned with so-called spin welding where pipes and/or pipe fittings are secured together by a coupling member that is spun at a high rate to melt the plastics material at the interface and create a welded connection.

5 Such welding techniques have been found to be perfectly adequate with relatively small diameters of couplers and pipes/fittings, but the employment of this technique has not proved to be quite so successful on larger diameters, and the larger the diameter the less is the guarantee that an effective fully homogenous welded joint will be created. Albeit that spin-weld connections on larger diameter pipes have proved difficult in the sense of ensuring complete homogeneity, what is so is that the weld provides a considerable strength against the pipes being  
10 pulled out of the coupling.

The object of the present invention is to overcome the problem of lack of homogeneity.

According to the present invention, a coupling sleeve-like member of plastics material has at least one inwardly projecting, circumferential rib within the bore of the member, there being  
15 an abutment means associated with the radial surfaces of the rib or ribs facing a respective end of the coupling sleeve-like member, to engage the end of a respective pipe or pipe fitting during the spinning of the coupling sleeve-like member.

The abutment means may be a shoulder on the inner periphery of the coupling sleeve-like member extending to the adjacent radial face of the or the respective, rib. Alternatively, the  
20 abutment means may be projections formed on the radial surfaces of the rib or the outer radial faces of outer ribs when more than one rib is provided. Desirably, the radial width of the projection is less than the width of the radial face on which it is located, and further preferably, has a cross-section that reduces from the junction between the projection and the radial face to

-2-

the outer extremity of the projection.

According to a second aspect of the invention, a method of producing a spin weld connection between a coupling sleeve-like member as is defined above and adjacent ends of pipes and/or pipe fittings, comprises introducing the ends of pipes and/or fittings into opposite  
5 ends of the coupling sleeve-like member, causing the coupling sleeve-like member to rotate about the ends of the pipes and/or fittings, and forcing the ends of the pipes and/or fittings inwardly of the coupling sleeve-like member as it rotates to engage the abutment means during rotation.

By causing an inward movement of the ends of the pipes and/or pipe fittings during rotation  
10 of the coupling sleeve-like member, the abutment means associated with the rib or ribs internally of the coupling sleeve-like member are caused to bite into the end faces of the pipes and/or fittings as the abutment means and the end faces begin to melt, continued inward movement causing the whole of the abutment means to melt and form a homogeneous connection between the outer surface of the pipe end/fitting and the inner surface of the sleeve-like member,  
15 additional to the creation of an effective weld between the end faces of the pipes/pipe fittings and the respective radial faces of the rib or ribs in the bore of the coupling sleeve-like member. As a result, a joint is provided where the weld over the outer surface of the large diameter pipes provides considerable axial strength in the joint, and the homogeneity of the weld between the rib in the coupling sleeve-like member and the end faces of the pipes and/or fittings can be  
20 guaranteed. Consequently, fully homogenous, high strength joints, are assured.

The precise shape of abutment means in the form of a projection on the radial faces of the rib in the coupling sleeve-like member can be varied. It may, for example, be of triangular section, or may be rounded at its outer extremity. It may be pyramidal or conical in shape, or more complex in shape, with concave surfaces.

-3-

In addition to substantially guaranteeing a homogenous weld, the invention has the added advantage of being able to accommodate pipe and/or pipe fitting ends that are not truly square, as a consequence of applying force to move the pipe ends inwardly of the coupling sleeve-like member during spin welding.

5 One embodiment of the invention will now be described with reference to the accompanying drawings in which :-

Figure 1 is a sectional side elevation of a sleeve-like member in accordance with the invention into which the ends of pipes/fittings have been inserted; and

Figure 2 corresponds to Figure 1 but shows a completed joint.

10 In the drawings a coupling sleeve-like member 1 has a socket 2 at each end to receive the end of a respective pipe end or fitting 3. Internally of the sleeve-like member 1 is a circumferential rib 4 having end faces 5 ultimately to be contacted by the end faces 6 of the respective pipe or fitting 3. Extending from each side of the circumferential rib 4 is an abutment 7, terminating in an end face 8.

15 To create an effective joint, the sleeve-like member 1 is rotated at a relatively high speed as the respective pipe ends/fittings 3 are inserted into a respective socket 2. Progressive insertion brings the end faces 6 of the pipe ends/fittings into contact with the end faces 8 on the abutments 7, continued insertion of the pipe ends/fittings and continued rotation causing the interface between the end faces 6 and 7 to melt, insertion of the pipe ends/fittings continuing until such time  
20 they abut the circumferential rib 4.

As a result, and as is particularly shown by Figure 2, the abutments 7 of each side of the circumferential rib 4 are effectively melted away to form a pool 9 of molten material between the outer surface of the pipe end/fitting 3 and the inner surface of the sleeve-like member 1 to create a homogeneous joint around the end of the pipe end/fitting, additional to the weld generated

-4-

between the end faces 5 of the internal rib 4 and the end faces 6 of the pipe ends/fittings. By virtue of the invention a substantial guarantee of an effective joint is provided for pipes/fittings of relatively large diameter with an ability to accommodate a noticeable deviation from true circularity of either the pipe ends/fittings or the sockets on the sleeve-like member.

## CLAIMS

1. A coupling sleeve-like member (1) of plastics material characterised in that there is provided at least one inwardly projecting circumferential rib (4) within the bore of the member (1), there being an abutment means (7) associated with the radial surfaces (5) of the rib or ribs (4) facing a respective end (2) of the member (1) adapted to engage the end (6) of a respective pipe or pipe fitting (3) during a spinning of the coupling sleeve-like member (1) and an insertion of the respective pipe or pipe fitting (3).
2. A coupling sleeve-like member as in Claim 1 characterised in that the abutment means (7) is a shoulder on the inner periphery of the coupling sleeve-like member (1) extending to the adjacent radial face (5) of the, or the respective, rib (4).
3. A coupling sleeve-like member as in Claim 1 characterised in that the abutment means are projections formed on the radial surfaces of the rib (4) or the radial surfaces of outer ribs when more than one rib is provided.
4. A coupling sleeve-like member as in Claim 3 characterised in that the radial width of the projection is less than the width of the radial face (5) on which it is located.
5. A coupling sleeve-like member as in Claim 3 or Claim 4 characterised in that the projection has a cross section that reduces away from the junction between the projection and the radial face (5) to the outer extremity of the projection.
6. A method of producing a spin weld connection between a coupling sleeve-like member (1) and adjacent ends (3) of pipes and or pipe fittings, characterised by introducing the ends (3) of the pipes and/or fittings into opposite ends (2) of the coupling sleeve-like member (1), causing the coupling sleeve-like member to rotate about the ends (3) of the pipes and/or fittings, and forcing the ends (3) of the pipes and/or fittings of the coupling sleeve-like member as it rotates to engage the abutment means (7) during rotation.

-6-

7. A method as in Claim 6 characterised in that the forcing of the ends (3) of the pipes and/or fittings is such as to cause the abutment means (7) to bite into the end faces (6) of the pipes and/or fittings (3) and generate a progressive melting of the abutment means whereby to form an effective weld between the end faces (6) of the pipes/pipe fittings (3) and the respective radial faces (5) of the rib or ribs (4) in addition to the weld formed between the inner surface of the coupling sleeve-like member (1) and the outer surfaces of the ends (3) of the pipes and/or fittings.



FIG. 1.

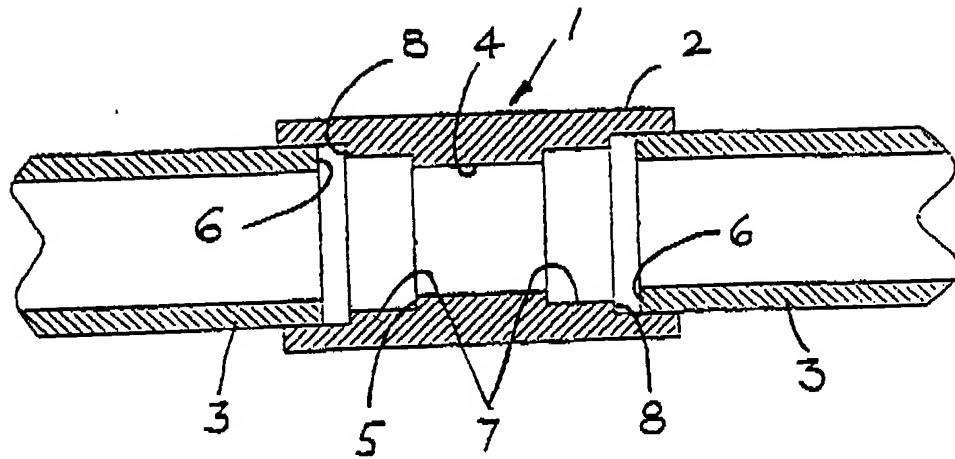
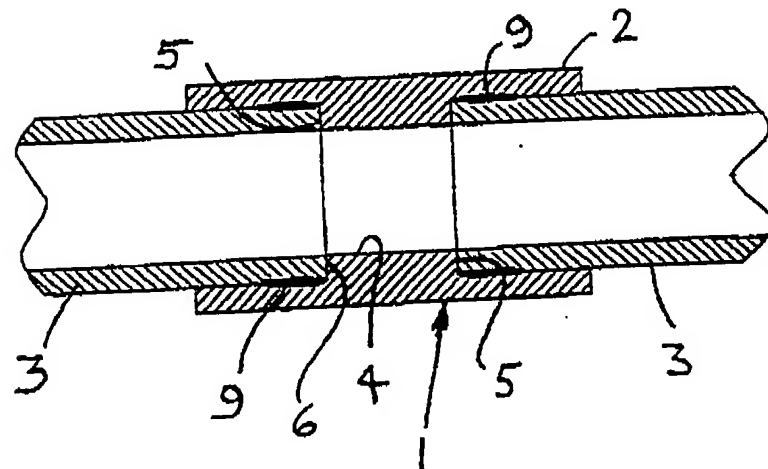


FIG. 2.



# INTERNATIONAL SEARCH REPORT

Inter national Application No  
PCT/GB 96/02711

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 B29C65/06 F16L47/02 //B29L23:00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 94 24477 A (FUSION GROUP PLC ;BRIDGSTOCK ERIC (GB)) 27 October 1994 see page 2, line 23 - page 3, line 8; claims 1-8; figures 1-4 ---	1-6
X	DE 39 03 551 A (VOSS ARMATUREN) 24 August 1989 see column 2, line 33 - line 47; figure 1 ---	1-6
X	PATENT ABSTRACTS OF JAPAN vol. 012, no. 121 (M-686), 15 April 1988 & JP 62 248623 A (MOLTEN CORP), 29 October 1987, see abstract; figures ---	1-6
A	US 3 244 574 A (J.DECKER) 5 April 1966 see column 2, line 51 - line 54; figures 1,2 ---	1-6
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

7 February 1997

Date of mailing of the international search report

12.03.97

Name and mailing address of the ISA  
European Patent Office, P.B. 5818 Patentaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Cordenier, J